

March 2022

# Food Safety



## Risk Assessment

### A Quantitative Risk Metric to Support Individual Sanitary Measure Reviews in International Trade

Eric D Ebel, Janell R Kause, Michael S Williams, Wayne D Schlosser, Stephanie Defibaugh-Chavez, Berhanu Tameru. *Int J Food Microbiol.* 2022 Mar 11;369:109616. doi: 10.1016/j.ijfoodmicro.2022.109616. [Article link](#)

**Significance:** A new risk metric based on prevalence and other data may inform U.S. trade assessments of whether products produced under an alternative inspection system in another country pose no greater consumer risk of foodborne illness than products produced under US food agency inspection.



In order for the United States Department of Agriculture's (USDA) Food Safety and Inspection Service (FSIS) to make an equivalence determination for a foreign meat, poultry or egg products inspection procedure that differs from FSIS inspection procedures (an Individual Sanitary Measure or ISM), a country must demonstrate objectively that its food safety inspection system provides the same level of public health protection as the FSIS inspection system. To evaluate microbiological testing data that such countries may submit to this end, we present a possible risk metric to inform FSIS's assessment of whether products produced under an alternative inspection system in another country

pose no greater consumer risk of foodborne illness than products produced under FSIS inspection. This metric requires evaluation of prevalence estimates of pathogen occurrence in products for the foreign country and the U.S. and determining what constitutes an unacceptable deviance of another country's prevalence from the U.S. prevalence, i.e., the margin of equivalence. We define the margin of equivalence as a multiple of the standard error of the U.S. prevalence estimate. Minimizing the margin of equivalence ensures the maximum public health protection for U.S. consumers, but an optimum choice must also avoid undue burden for quantitative data from alternative inspection systems in the foreign country. Across a wide range of U.S. prevalence levels and sample sizes, we determine margin of equivalence values that provide high confidence in conclusions as to whether or not the country's product poses no greater risk of foodborne illness from microbiological pathogens. These margins of equivalence can be used to inform FSIS's equivalence determination for an ISM request from a foreign country. Illustrative examples are used to support this definition of margin of equivalence. This approach is consistent with the World Trade Organization's concept of risk equivalence and is transparent and practical to apply in situations when FSIS makes an equivalence determination for an ISM requested by a foreign country.

## Foodborne Pathogens

### Desiccation Survival of *Salmonella enterica*, *Escherichia coli*, and *Enterococcus faecium* Related to Initial Cell Level and Cellular Components

Joelle K Salazar, Bereket Tesfaldet, Michelle Zamperlini, Rachel Streufert, Megan Fay, Susanne E Keller. *J Food Prot.* 2022 Feb;85(3):398-405. doi: 10.4315/JFP-21-320. [Article link](#)

**Significance:** Previous studies have indicated a link between the initial cell level and the population of *Salmonella* that survives after desiccation and subsequent storage; however, how the initial cell concentration affects survival is unknown. This study was conducted to examine this phenomenon and to determine whether it occurs in other microorganisms.

*Salmonella enterica* is well known for its ability to survive and persist in low-moisture environments. Previous studies have

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indicated a link between the initial cell level and the population of *Salmonella* that survives after desiccation and subsequent storage; however, how the initial cell concentration affects survival is unknown. This study was conducted to examine this phenomenon and to determine whether it occurs in other microorganisms, specifically *Shiga toxinogenic Escherichia coli* (STEC) and *Enterococcus faecium*. *Salmonella*, STEC, and *E. faecium* were grown as sessile cells on Trypticase soy agar with yeast extract (TSAYE) and harvested in buffered peptone water (BPW). To determine recovery at different initial cell levels, cultures were diluted to 9, 7, and 5 log CFU/mL and applied to filters. Filters were dried for 24 h and then stored for 28 days at 25°C and 33% relative humidity. During storage, cells were recovered from filters with BPW and cultivated on TSAYE. Recovery of both *Salmonella* and *E. coli*, but not *E. faecium*, was nonproportional. Lower initial populations were less viable after 24 h of desiccation;  $\geq 10$  log CFU/mL was recovered when 11 log CFU/mL was desiccated, but  $< 3$  log CFU/mL was recovered when 5 log CFU/mL was desiccated. Once dried, persistence did not appear affected by initial cell concentration. When inactivated (heat-treated) cells were added to the diluent, recovery of *Salmonella* was proportional with respect to the initial cell level. To further examine the response to desiccation, *Salmonella* was diluted in BPW containing 1 of 11 test cell components related to quorum sensing or known to affect desiccation resistance to assess recovery and persistence. Of the 11 additions, only cell debris fractions, cell-free extract, and peptidoglycan improved recovery of *Salmonella*. Desiccation survival appears related to cell wall components; however, the exact mechanism affecting survival remains unknown.

## Foodborne Illness

### Analysing Foodborne Illness Outbreak Severity in the USA, 2009-19

Ryan Simpson, Lauren Sallade, Emily Sanchez, Yutong Zhang, Elena Naumova. *Lancet Glob Health*. 2022 Mar;10 Suppl 1:S5. doi: 10.1016/S2214-109X(22)00134-6. [Article link](#)

**Significance:** Publicly reported surveillance data is key to data-driven monitoring of the severity of foodborne outbreaks' spread, duration, and morbidity and mortality.

**Background:** In the USA, one in six Americans have had a foodborne illness, resulting in approximately US\$17.6 billion (2018) of losses annually attributed to medical costs, productivity losses, and economic burden due to death. Previous research has characterized these burdens with use of various methods, including disability-adjusted life-years (DALYs), medical care costs, and revenue losses of food retailers. However, these indices assess only the socioeconomic burdens of outbreaks without providing an index to compare the health-related severity of outbreaks regarding geographical spread of transmission, outbreak duration, and the morbidity and mortality of case outcomes. **Methods:** In this study, we proposed a data-driven index for evaluating outbreak severity using the publicly available US Centers for Disease Control and Prevention's National Outbreak Reporting System (NORS) database from Jan 1, 2009, to Dec 31, 2019. We identified 67 metrics related to the geographical extent (eg, counties or states where individuals with a foodborne illness resided and were exposed), case severity (eg, primary cases, hospital admissions, emergency room visits, and deaths), duration (e.g. days of illness and days of exposure events), and their ratios. We selected 11 metrics to create the index on the basis of completeness and distributional characteristics of these metrics. We generated index scores by normalising natural log-transformed values on a 0-1 scale and averaging all metrics per outbreak. Scores ranged from 0 (lowest severity) to 1 (highest severity). **Findings:** NORS reported 9407 outbreaks in our 11-year study period. We found that bacterial outbreaks associated with the genera *Streptococcus*, *Listeria*, and *Salmonella* had the highest median severity scores, whereas *Bacillus*, *Staphylococcus*, and *Clostridium* had the lowest scores. Among protozoa, *Cryptosporidium* and *Cyclospora* had the lowest median scores, whereas *Giardia* and *Toxoplasma* had the highest scores. Hepatitis had the highest median score for virus-associated outbreaks, whereas Norovirus, which had the most outbreaks reported in our study period (n=3088), had the lowest score. **Interpretation:** Our index illustrates the usefulness of publicly reported surveillance data in establishing a data-driven approach for monitoring the severity of foodborne outbreaks regarding their spread, duration, and morbidity and mortality. Differences in outbreak severity by pathogen inform how to best allocate resources for monitoring, tracking, and preventing foodborne disease outbreaks. Being data driven, our index emphasizes the importance of improved data quality, integrity, and completeness of surveillance records. Future research should strive to validate this index by use of longitudinal cohort studies.

## Mycotoxins

### Microbiological and Mycotoxicological Analyses of Processed Cereal-Based Complementary Foods for Infants and Young Children from the German Market

Christina Rehagel, Ömer Akineden, Ewald Usleber. *J Food Sci*. 2022 Mar 12. doi: 10.1111/1750-3841.16106 [Article link](#)

**Significance:** This study of the German market found that as long as processed cereals are freshly prepared and consumed quickly, the risk posed by opportunistic bacteria appears to be minimal.

This study investigated several food safety criteria in 38 different commercial products of processed cereal-based foods (PCF) from the German market. Microbiological assessment, followed by 16S RNA gene sequencing of suspect colonies, included aerobic mesophilic bacteria, moulds, *Enterobacteriaceae*, *Cronobacter* spp., and presumptive *Bacillus cereus*. Mycotoxin analyses were performed by enzyme immunoassays for deoxynivalenol (DON), zearalenone (ZEN), T-2/HT-2 toxins (T-2/HT-2; oat containing products only), ergot alkaloids (EA), and alternariol (AOH). No violative result above existing European Union regulations or international guidelines was obtained. Most samples had very low aerobic mesophilic cell counts ( $<2.0 \times 10^1$  CFU/g), the maximum was  $9.6 \times 10^2$  CFU/g. A few samples contained low numbers of opportunistic pathogens, most notably *Cronobacter sakazakii*, *Acinetobacter* spp., *Pantoea* spp., and enterotoxigenic *Bacillus wiedmannii*. Levels of mycotoxin contamination were very low, well below European Union maximum limits. DON was found in 10 samples, at levels of 9-35 µg/kg. T-2/HT-2 were found in all 15 oat-based products (1-8 µg/kg). All samples were negative for ZEN and EA. A high number (n = 25) of samples yielded weakly positive results for the nonregulated AOH (0.4-2 µg/kg), but just three samples exceeded a level of 1 µg/kg. No relationship between cereal composition and analytical findings for microbiological parameters and mycotoxins could be found. As long as PCF meals are freshly prepared and consumed immediately after preparation, the risk from sporadically occurring opportunistic bacteria appears to be minimal.



## Heavy Metals

### Review of Regulatory Reference Values and Background Levels for Heavy Metals in the Human Diet

Candace Wong, Stephen M Roberts, Imad Neal Saab. *Regul Toxicol Pharmacol.* 2022 Apr;130:105122. doi: 10.1016/j.yrtph.2022.105122. 2022 Feb 8. [Article link](#)

**Significance:** A review of metal risk estimates compared with exposures included re-evaluated toxicity values and dietary exposure estimates. Exposures to cadmium, arsenic, and mercury were found to be below reference values based on non-cancer effects.



This work was supported by the IAFNS [Food & Chemical Safety Committee](#).

### Highlights

- The Institute for the Advancement of Food and Nutrition Sciences has updated a heavy metals screening tool for foods
- The update included re-evaluated toxicity values and dietary exposure estimates used to estimate potential risks.
- Exposures to cadmium, arsenic, and mercury were found to be below reference values based on non-cancer effects.
- Because exposure to chromium in foods is minimal, chromium was removed from the screening tool.
- Intake of lead from food and water is nearly equivalent to recent reference values set by the FDA for young children.

The U.S. Food and Drug Administration (US FDA) has identified dietary exposure to heavy metals as a public health concern, focusing particularly on arsenic, cadmium, lead, and mercury. One way to determine current risk is to compare established safe exposure limits (reference values) with current population-based dietary background levels. Information on reference values and dietary background exposures for these metals and chromium were critically evaluated in support of an interactive risk assessment screening tool (Heavy Meals Screening Tool [HMST]). Cadmium, arsenic, and mercury background exposures from food and water were found to be below current safe US regulatory

limits based on non-cancer effects, while lead background exposures were nearly equivalent to the US FDA's newest interim reference level for children. Because detections of chromium in foods are infrequent and data on speciation (trivalent versus hexavalent) are limited, chromium was excluded from the HMST. The focus of this work was to present U.S. based reference and background exposure values, although the tool can use inputs that may be more appropriate for other countries, cultures, and situations. With emerging science, new health endpoints, and changes in food consumption trends, both reference values and background exposure levels are likely to evolve.

### **The Associations of Dietary Copper with Cognitive Outcomes: The ARIC Study**

Jingkai Wei, Kan Z Gianattasio, Erin E Bennett, James D Stewart, Xiaohui Xu, Eun Sug Park, Richard L Smith, et al. *Am J Epidemiol.* 2022 Mar 3;kwac040. doi: 10.1093/aje/kwac040. [Article link](#)

**Significance:** This review of dietary sources of copper and its impact on cognition found that a diet high in copper, particularly when combined with a diet high in saturated fat, may increase the risk of cognitive impairment.

Dietary copper intake may be associated with cognitive decline and dementia. We used data from 10,269 participants of the Atherosclerosis Risks in Communities Study to study the associations of dietary copper intake with 20-year cognitive decline and incident dementia. Dietary copper intake from food and supplements was quantified using food frequency questionnaires. Cognition was assessed using three cognitive tests at study visits; dementia was ascertained at study visits and via surveillance. Multiple imputation by chained equations was applied to account for the missing information of cognitive function during follow-up. Survival analysis with parametric models and mixed-effect models were used to estimate the associations for incident dementia and cognitive decline, respectively. During 20 years of follow-up (1996-1998 to 2016-2017), 1,862 incident cases of dementia occurred. Higher intake of dietary copper from food was associated with higher risk of incident dementia among those with high intake of saturated fat (hazards ratio: 1.49, 95% confidence interval (CI): 1.04, 1.95). Higher intake of dietary copper from food was associated with greater decline in language overall (beta: -0.12, 95% CI: -0.23, -0.02). Therefore, a diet high in copper, particularly when combined with a diet high in saturated fat, may increase the risk of cognitive impairment.

### **Food Packaging**

#### **High-Pressure Treatment of Water-Filled Co-Extruded Polylactide Films: Effect on Microstructure, Barrier, Thermal and Rheological Properties**

Jasim Ahmed, Mehrajfatema Z Mulla, Aateka Vohra. *J Food Sci.* 2022 Mar 9. doi: 10.1111/1750-3841.16096. [Article link](#)

**Significance:** The findings reported here could help improve packaging materials design so that it can successfully resist high-pressure processing and thermal processing of food.

The impact of high-pressure treatments (450 and 600 MPa) on the morphological, thermal, structural, and barrier properties of commercial coextruded polylactide (PLA) packaging films has been explored to evaluate their applicability in food processing. Pouches filled with water as a food simulant were subjected to high-pressure treatment for 15 min at ambient temperature. Results indicated no significant changes in the visual appearance, color, integrity, or water barrier properties of the post-process pouches. However, high-pressure treatment affected mechanical property results. Thermal analysis of the film showed endothermic double melting peaks (165.12 and 170.55°C), which did not change with the pressurization; however, the exothermic crystallization peak (118.08°C) varied significantly. Both SEM and AFM micrographs demonstrated that the surface morphology and roughness parameters (arithmetic mean [Sa] and root mean square height [Sq]) of the films were significantly affected by the HP treatment, which is further complemented by the FTIR spectra and XRD diffractogram. Melt rheology (175-205°C) of the pressure-treated films showed a significant drop (20-30%) in mechanical rigidity ( $G'$ ) when compared to the untreated sample. Changes in the microstructure/crystallinity in the PLA films were indicated by van Gurp and Palmen plot. **PRACTICAL APPLICATION:** The results reported here can help to improve the design of the coextruded packaging materials so that it can be successfully implemented to high-pressure processing and high pressure-assisted thermal processing of food.

### **Chemical Contaminants**

#### **Acrylamide in Corn-Based Thermally Processed Foods: A Review**

Slađana Žilić, Valentina Nikolić, Burçe Ataç Mogol, Aytül Hamzalıoğlu, Neslihan Göncüoğlu Taş, Tolgahan Kocadağlı, Marijana Simić, Vural Gökmen. *J Agric Food Chem.* 2022 Mar 31. doi: 10.1021/acs.jafc.1c07249. [Article link](#)

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**Significance:** Thermally processed corn-based foods contribute to acrylamide in the diet, thus bearing a high public health risk and warranting reduction efforts.

Widely consumed thermally processed corn-based foods can have a great contribution to acrylamide dietary intake, thus bearing a high public health risk and requiring attention and application of strategies for its reduction. This paper reviews the literature on the acrylamide content of corn-based food products present in the market around the world. The potential of corn for acrylamide formation due to its content of free asparagine and reducing sugars is described. Human exposure to acrylamide from corn-based foods is also discussed. The content of acrylamide in corn/tortilla chips, popcorn, and corn flakes, as widely consumed products all over the world, is reported in the literature to be between 5 and 6360 µg/kg, between <LOD and 2220 µg/kg and between <LOD and 1186 µg/kg, respectively. Although these products are important acrylamide sources in the common diet of all age populations, higher intake values occurred among younger generations.

## Caffeine

### Effects of Caffeine Ingestion on Physiological Indexes of Human Neuromuscular Fatigue: A Systematic Review and Meta-Analysis

Ruishan Sun, Junya Sun, Jingqiang Li, Shuwen Li. *Brain Behav.* 2022 Mar 23;e2529. doi: 10.1002/brb3.2529. [Article link](#)

**Significance:** This review shows that caffeine intake had a large effect on voluntary activation, potentiated twitch (PTw), and M-wave, all of which can be used as characteristic indices of caffeine's impact on neuromuscular fatigue.

**Background:** Caffeine is often used as a stimulant during fatigue, but the standard of characteristic physiological indicators of the effect of caffeine on neuromuscular fatigue has not been unified. The purpose of this systematic review and meta-analysis is to summarize current experimental findings on the effects of caffeine on physiological indexes before and after neuromuscular fatigue, identify some characteristic neuromuscular physiological indexes to assess the potential effects of caffeine. **Methods:** The Preferred Reporting Items for Systematic Reviews and Meta-analyses are followed. We systematically searched PubMed, Google academic, and Web of Science for randomized controlled trials. We searched for studies on caffeine's (i) effects on neuromuscular fatigue and (ii) the influence of physiological indexes changes. Meta-analysis was performed for standardized mean differences (SMD) between caffeine and placebo trials in individual studies. **Results:** The meta-analysis indicated that caffeine significantly improves voluntary activation (VA) (SMD = 1.46;95%CI:0.13, 2.79; p < .00001), PTw (SMD = 1.11, 95%CI: -1.61, 3.84; p < .00001), and M-wave (SMD = 1.10, 95%CI: -0.21, 2.41; p < .00001), and a significant difference (p = .003) on measures of Peak Power (PP), and insignificant difference on measures of heart rate (HR) (I<sup>2</sup> = 0.0, p = .84) and Maximal oxygen uptake (VO<sub>2</sub>) (I<sup>2</sup> = 0.0, p = .76). **Conclusion:** The analysis showed that caffeine intake had a relatively large effect on VA, potentiated twitch (PTw), M-wave, which can be used as characteristic indexes of caffeine's impact on neuromuscular fatigue. This conclusion tends to indicate the effects of caffeine on neuromuscular fatigue during endurance running or jumping or muscle bending and stretching. The caffeine intake had a big effect on the electromyogram (EMG) and peak power (PP), and its effect role needs to be further verified, this conclusion tends to indicate the effect of caffeine on neuromuscular fatigue during jumping or elbow bending moment movements. HR, VO<sub>2</sub>, maximal voluntary contraction (MVC) cannot be used as the characteristic indexes of caffeine on neuromuscular fatigue. This conclusion tends to indicate the effect of caffeine on neuromuscular fatigue during endurance exercise. However, the results of meta-analysis are based on limited evidence and research scale, as well as individual differences of participants and different physical tasks, so it is necessary to interpret the results of meta-analysis cautiously. Therefore, future research needs to explore other physiological indicators and their indicative effects in order to determine effective and accurate characteristic indicators of caffeine on neuromuscular fatigue.

## Food Allergens

### Tolerance Induction through Non-Avoidance to Prevent Persistent Food Allergy (TINA) in Children and Adults with Peanut or Tree Nut Allergy: Rationale, Study Design and Methods of a Randomized Controlled Trial and Observational Cohort Study.

Valérie Trendelenburg, Sabine Dölle-Bierke, Nathalie Unterleider, Aikaterina Alexiou, Birgit Kalb, Lara Meixner, Stephanie Heller, et. al. *Trials.* 2022 Mar 28;23(1):236. doi: 10.1186/s13063-022-06149-4. [Article link](#)

**Significance:** A new trial will evaluate whether consumption of low amounts of allergen may build tolerance development and to what extent regular allergen consumption in sensitized but not tolerant subjects prevents the

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the (re-)development of peanut or tree nut allergy.

**Background:** Peanuts (PN) and tree nuts (TN) are among the most frequent elicitors of food allergy and can lead to life-threatening reactions. The current advice for allergic patients is to strictly avoid the offending food independently of their individual threshold level, whereas sensitized patients without allergic symptoms should frequently consume the food to avoid (re-)development of food allergy. The aim of this trial is to investigate (I) whether the consumption of low allergen amounts below the individual threshold may support natural tolerance development and (II) to what extent regular allergen consumption in sensitized but tolerant subjects prevents the (re-)development of PN or TN allergy.

**Methods:** The TINA trial consisting of (part I) a randomized, controlled, open, parallel group, single-center, superiority trial (RCT), and (part II) a prospective observational exploratory cohort study. Children and adults (age 1-67 years) with suspected or known primary PN and/or TN allergy will undergo an oral food challenge (OFC) to determine their clinical reactivity and individual threshold. In the RCT, 120 PN or TN allergic patients who tolerate  $\geq 100$  mg of food protein will be randomized (1:1 ratio) to consumption of products with low amounts of PN or TN on a regular basis or strict avoidance for 1 year. The consumption group will start with 1/100 of their individual threshold, increasing the protein amount to 1/50 and 1/10 after 4 and 8 months, respectively. The primary endpoint is the clinical tolerance to PN or TN after 1 year assessed by OFC. In the cohort study, 120 subjects sensitized to PN and/or TN but tolerant are advised to regularly consume the food and observed for 1 year. The primary endpoint is the maintenance of clinical tolerance to PN and/or TN after 1 year assessed by challenging with the former tolerated cumulative dose. **Discussion:** This clinical trial will help to determine the impact of allergen consumption versus avoidance on natural tolerance development and whether the current dietary advice for PN or TN allergic patients with higher threshold levels is still valid.

## Emerging Science Areas

### ***Global Plastic Waste Management: A Global Sustainability Challenge.***

#### **A Review of Current Challenges and Legal Advances in the Global Management of Plastic Waste.**

Seay, J., Ternes, M.E. *Clean Techn Environ Policy* 24, 731–738 (2022). doi.org/10.1007/s10098-022-02289-y.

#### **Article link**

**Significance:** Plastic waste, especially microplastics, is a growing global issue and recycling such waste is challenging in practice. New chemical recycling technologies, manufacturing approaches and regulations may present hope for new innovation avenues and future management.

Plastic waste is an ever-growing global challenge, perhaps second only to climate change in its scope and impact. Unmanaged plastic waste can be found on every continent and every ocean, from mountaintops to the seafloor. In addition to the plastic we can see, over time, plastics break down into smaller and smaller pieces called microplastics, and in that form, plastic has worked its way into the food chain—from plankton to humans. Plastics have been touted as recyclable, but in practice, recycling is difficult and has not proven to be an effective solution. Additionally, current laws and regulations are not sufficient in slowing the use—and misuse—of plastic. However, there is reason for optimism. New technologies like chemical recycling and new manufacturing approaches aim to make the process of recycling plastic easier and new and proposed regulations around the world are beginning to take a radically different approaches to addressing and recognizing the potential harm to the environment and human health done by plastics. In this review, we will address the current state of plastic waste management from a technical and policy perspective and look forward to potential changes and innovations on the horizon.

## Engage with IAFNS

- **Understanding Gut Microbiota, COVID-19, and Nutrition: Interactions, Interventions, and Unknowns.** April 21, 2022. 10:00-11:00 am ET.
  - It is well-established that the gut microbiota plays a role in regulating the immune system, including modifying the response to viral infections. In fact, research indicates that the severity of COVID-19 is related in part to the composition of the gut microbiota. How can diet and nutrition support the microbiota-dependent immunoregulatory functions? What do we really know today, and what is under investigation? For more information, click [here](#).
- **Nutrition as a Human Right – Disease Related Malnutrition** May 5, 2022, pre-conference event. Hybrid, Gatineau (Quebec), Canada – and on-line
  - IAFNS is partnering with the Canadian Nutrition Society and the Canadian Malnutrition Task Force to offer a Food for Health Workshop as a Pre-Conference event immediately preceding the Canadian Nutrition Society meeting. For more information, click [here](#).

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- **GS1 Connect 2022.** June 7–9, 2022. San Diego, CA.
    - IAFNS is representing the Partnership on the USDA Global Branded Food Products Database at GS1 Connect 2022. This event brings trading partners together to learn about standards-based business processes and best practices for optimum efficiencies in managing the supply and demand sides of their value chain. IAFNS’ presentation will focus on sharing data within the USDA Branded Food Product Database. For more information, click [here](#).
  - **IAFNS Annual Meeting & Science Symposium: Advancing Science for Impact**  
June 21-23, 2022, at the National Press Club in Washington DC.
    - The IAFNS Annual Meeting & Scientific Symposium is a forum for the presentation and discussion of research and ideas—focusing on science with impact. The focus will be on science that supports credible decision making by government regulators, industry professionals and academic researchers. The conference offers an exceptional learning environment and brings together a range of experts, including food and nutrition researchers, healthcare professionals, opinion leaders, industry representatives, government officials, and future leaders. The Keynote address will be delivered by Dr. Susan Mayne, Director of the Center for Food Safety and Applied Nutrition (CFSAN) at the US Food and Drug Administration. To register, click [here](#).